TRAFFIC SIGNAL DESIGN

Technical Design Manual #5

Chandler • Arizona

February 2012

TRAFFIC SIGNAL DESIGN
CITY OF CHANDLER

Table of Contents

TRAFFIC SIGNAL DESIGN
CITY OF CHANDLER

List of Details

Detail

Details follow page 8 of the Manual

FORWARD

The purpose of this manual is to assist developers and their consultants in the planning and design of traffic signals within the city of Chandler's right of way. The guidelines contained within this manual are intended for use by professional engineers and designers with a background in the underlying fundamentals in Traffic Engineering. This manual does not provide the answers for all situations involving the design of traffic signals. It does, however, provide the tools for solving most of them. It is expected that those designing traffic signals within the City of Chandler bring to each project the skills and abilities to provide the optimum traffic control device to the public. This may include any new signal design concepts that result in a higher quality of traffic control and/or cost effectiveness. Deviations from these standards must be approved by the City of Chandler, City Transportation Engineer prior to submittal for review and approval.

This manual is divided into the following sections:

Developer's Checklist	Electrical Service
Plan Development	Signal Poles
Conduit & Conductors	Junction Boxes
Controller & Cabinet	Detectors
Internally Illuminated Street Name Signs	Signal Heads

Any questions regarding the signal design should be addressed to:

City Transportation Engineer
City of Chandler
215 East Buffalo Street
Mail Stop 402
P.O. Box 4008
Chandler, Arizona 85224-4008
Phone: (480) 782-3470

1 - DEVELOPER'S CHECKLIST

A checklist has been developed to assist developers/consultants in the design of traffic signals in the City of Chandler. This checklist is not intended to be all inclusive, but a helpful guide in the design of traffic signals.

The following items should be researched for inclusion into the traffic signal design plans or in the development of the plans:

- ❑ Contact Blue Stake (602-263-1100) to determine existing utilities in the area.

- ❑ Survey the intersection for the development of a base plan. This survey should be performed after the intersection has been Blue Staked by the utility companies. In addition to the utilities, the survey should locate all existing roadway features within the intersection and 200 feet up each leg of the intersection. This includes face-of-curb, back-of-sidewalk, curb inlets, pavement markings, signs, walls and any landscaping that may affect the location of traffic signal equipment.

- ❑ Conduct a field visit of the intersection to verify the survey.

- ❑ Obtain maps from the utility companies and roadway as-builts from the City to supplement the survey.

- ❑ Contact the electric service company (Arizona Public Service (APS) or Salt River Project (SRPO)) to determine a power source location for the signal.

- ❑ Obtain existing and/or future right-of-way in the area and identify on the plans.

The developer/consultant should anticipate a minimum of two (2) submittals to the City prior to approval of the traffic signal. Upon approval of the signal, seven (7) sets of approved plans should be delivered to the City. These will be distributed as follows:

3 Sets - Development Services Plans Review Branch
2 Sets - Traffic Engineering Branch
1 Set - Signal Maintenance Shop
1 Set - Inspection

Plan approvals are limited to six (6) months after the approval date and may be renewed for another six (6) months if no changes to the existing or future intersection configuration have occurred.

2 - ELECTRICAL SERVICES

The City of Chandler is served by two electrical service companies: Salt River Project (SRP) and Arizona Public Service (APS). The service areas for each company are provided in Figure TS-1. The signal designer should contact the appropriate utility company early in the design process so that a "point of service" location can be identified. The contact phone number and address for each utility contact is as follows:

Mr. Ken Barry
Salt River Project
EVS 107
PO Box 52025
Phoenix, Arizona 85072-2025
Phone: (602) 236-0840

Mr. Steve Goodman
Arizona Public Service
PO Box 53933
Mail Station 3162
Phoenix, AZ 85072-3933
Phone: (602) 371-6965

All new traffic signals shall use metered power service.

3 - PLAN DEVELOPMENT

Traffic signal plans submitted for approval by the City of Chandler should be prepared using the Computer Aided Design and Drafting (CADD) software AutoCAD(r) and comply with the City of Chandler's CADD Standards as indicated below.

The City of Chandler uses a coversheet and two plan sheets for the design of traffic signals, see Figures TS-2, TS-5 and TS-6.

Coversheet (*Figure TS-2)* contains the project title, vicinity map and the general Notes. Contact the City of Chandler Development Services for format and Content requirements.

Sheet 1 *(Figure TS-5)* is used for the signal layout and contains a legend and the Notes to the contractor.

Sheet 2 *(Figure TS-6)* contains the pole and cabinet schedule, conductor Schedule, phasing schedule and wiring diagrams.

(The schedules and wiring diagrams in Fig. TS-5 are shown in greater detail in Figures TS-9 through 12.)

All symbols used in the design of traffic signals shall conform to Arizona Department of Transportation standards. These are summarized in Figs. TS-3 and TS-4.

AutoCAD(r) has the ability to place design information on several different layers in a file. This allows the separation of different design elements onto separate layers. The following is a recommended layering structure for the design of traffic signals:

SHEET 1 (*Plan View)*
Layer 1 (name – Title) shall be reserved for the border, title block, and legend.
Layer 2 (name – Ex.Roadway) shall be reserved for the existing roadway Configuration including curbs, sidewalks, striping, signing and edge of pavements
Layer 3 (name – Utilities) shall be reserved for any existing signals, including Junction boxes and conduit specifically used for traffic signal.
Layer 5 (name – New Signal) shall be reserved for all new signal equipment as Part of the signal design. Any general notes shall be included on this layer.
Layer 6 (name – Striping) shall be used for any striping or signing changes to be

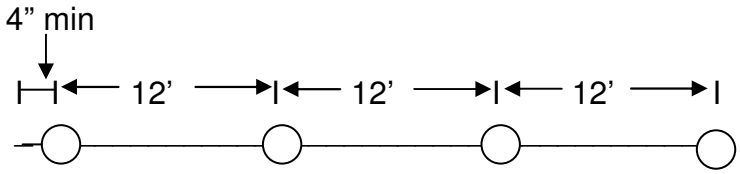
Added in conjunction with the signal design.
Layer 7 (name – Construction) shall be reserved for any roadway improvements Needed in conjunction with signal installation.
Layer 8 (name – Future) shall be reserved for any future improvements to the Roadway, traffic signal, etc.

SHEET 2 (*Schedules and Diagrams)*
Layer 1 (name – Title) shall be reserved for the border and title block.
Layer 2 (name – Schedules) shall be reserved for the pole and cabinet, conductor and phase schedules
Layer 3 (name – Diagrams) shall be reserved for the wiring diagrams.
The Developer/Consultant shall submit electronic files to the City when plans are submitted for their approval signature. Approval of the design plans is contingent upon conformance to the above design formats.

4 - SIGNAL POLES

The City of Chandler uses standard ADOT signal poles and foundations. It is recommended that the designer obtain a current copy of ADOT's "Traffic Signals & Lighting" Standard Drawings and the latest Special Provisions. All poles shall be per ADOT specifications and TENON specifications.

Traffic Signal Tenon Locations for ADOT Standard Drawing



Typical Tenon Locations:
See Schedule for number of Tenons
Note: Not used for mast arms 20 foot or less

TENON SCHEDULE

Pole Type	Arm Length	# of Tenons
K, R	45', 50', 55'	4
J, Q	35', 40'	3
J, Q	25', 30'	2
E, F	15', 20'	1

The City typically requires one pole for each corner of the intersection. Where site condition dictates, 2 poles may be used. One pole shall be a type 'A' pole (or type 'G' pole

depending on street lighting needs), while the other shall be a 'J' 'K' or 'Q' 'R' depending on mast arm length and whether or not a luminaire is included on the pole. A typical pole layout is shown in Figure TS-13.
Where signal poles cannot be placed directly adjacent to the handicap ramp to meet American Disability Act (ADA) requirements, the ramp shall be modified per Detail No TS-20.
Signal poles and mast arms in the City of Chandler downtown area (See Detail No. TS-1 for delineation of downtown area) are required to be trombone style and have a finish coat color of Park Green (Sherwin Williams F78XXG27314387).
Signal poles and mast arms on Arizona Avenue and Chandler Boulevard (outside the downtown area) are required to have a finish coat color of Tobacco Brown (Dunn Edwards DE-EX-11).

5 - JUNCTION BOXES

The City of Chandler uses three sizes of junction boxes, No. 5, No. 7 , and No. 9. The pullboxes are required to meet ADOT's Standards and Specifications. The No. 5 junction box is placed adjacent to the electrical "point of service" location as agreed to by the utility company. The No. 7 junction box is placed on all corners of the intersection, using a No. 7 with extension in front of the traffic signal cabinet. It is generally placed behind the sidewalk at the center of the radius. If no sidewalk of curbing exists or is planned with the signal installation, then the junction box should be placed as close as possible to the ultimate location. All junction boxes containing interconnect cable shall be No. 7 with the extension or No. 9, as determined by the City Transportation Engineer. Figure TS-14 provides typical locations for junction boxes, meter pedestal, and controller.

6 - CONDUITS AND CONDUCTORS

6.1 Conduit

The City of Chandler uses three conduit sizes for their traffic signals; 1½-inch, 2-inch and 4-inch. The 2-inch conduit is used to connect the boxes and signal pole foundations. Two 2-inch conduits shall also be provided from the point of service. One of the 2-inch conduits shall be used between the point of service junction box and the controller cabinet foundation. The other 2-inch conduit shall be used between the point of service and the No. 7 junction box. The 4-inch conduit is used between the No. 7 junction boxes and is also used for any conduit run underneath the travelled way. Conduits shall connect the controller cabinet foundation with a No. 7 junction box. All conduits entering the controller foundation shall be oriented per Figure TS-19. (layout detail)All conduit runs shall be straight when possible. See figure TS-14 for meter pad and conduit placement.

Interconnect conduit shall be comprised of 4-inch conduit with three 1-1/4 inch innerduct, colored red, orange, and black. All unused innerduct shall have 2500 pound detectable mule tape installed, with detectable members splice across junction boxes using continuously detectable run. All interconnect conduit shall enter junction boxes using 45-degree sweeps with no less than a 36-inch radius. Interconnect conduit shall be installed at a depth no less than 48-inches. A 2-inch conduit shall be installed directly into the controller foundation exclusively for the interconnect cable. This 2-inch conduit shall

run between the controller foundation and the interconnect junction box (or intersection junction box in the event that an exclusive interconnect junction box is unavailable in that corner).

6.2 Conductors

The City of Chandler uses standard IMSA conductor cables for the traffic signal wiring. The following describes the type and use of conductors:

No. 14 AWG, 5 conductor is used from signal pole to inside mast arm head.
No. 6 AWG is used between the power supply and the controller.
No. 14 AWG, 7 conductor is used from signal pole to outside mast arm head.
No. 8 AWG bare bond (green) is used in all conduit runs.

No. 10 AWG is used for the internally illuminated street name signs and the Luminaire. In addition, a common shall be included in the runs. Streetlight Conduction shall be red and street name sign conduction shall be brown. Conductors shall be fused in the No. 7 junction box.

IMSA 20-1 signal cable, No. 14 AWG 20 conductor is used between the Controller and each pole.

6.3 Interconnect

Interconnect cable shall be between 48 and 144 strands (as determined by the City Transportation Engineer) with 12 fibers per buffer tube, single mode, fiber optic cable meeting the following specifications:

Fibers per cable	48 to 144 strands for main trunkline cables 6 for branch cables
Cladding diameter:	125.0 microns
Core diameter:	8.3 microns nominal
Core eccentricity:	≤1.0 micron (0.3 typical)
Temperature range:	-34°C to +74°C
Coating thickness:	50±15 microns
Cable construction:	Loose tube
Outer jacket:	Polyethylene
Bending radius:	20 x Dia. minimum
Tensile strength:	600 pounds
Strength member:	Dielectric
Mode field diameter:	9.3±0.5 microns
Zero dispersion wavelength:	1300 to 1320 nm
Zero dispersion slope:	≤0.092 picosec/nm^2-km
Cutoff wavelength	1260 nm
Point discontinuities at 1300 nm:	≤0.1dB

The interconnect cable shall be fiber optic cable only. The fiber optic interconnect cable shall run continuous for the complete extent of the project limits. Full splicing of the fiber

optic interconnect cable mid-project will not be allowed. Any construction requiring the relocation or replacement of twisted-pair copper shall be replaced with fiber optic cables.

All infrastructure shall be constructed "fiber friendly". The interconnect conduit shall be 4-inch conduit with three 1 ¼ inch innerducts in three different colors. All empty innerducts shall have 2500 lb detectable mule tape installed, with detectable members spliced across pull boxes, creating a continuous detectable run. ADOT standard #9 pull boxes, or approved equivalent, shall be installed at all arterial/arterial intersections as well as end of project conditions. ADOT standard #7 pull boxes, with extension, shall be installed at ¼ mile intervals and/or points of known or future signalized intersections with collector streets. All conduit shall enter pull boxes with 45-degree sweeps (where required) with no less than a 36-inch bend radius anywhere within the conduit run. Every effort shall be made to minimize variations in the conduit profile (i.e. bends, vertical & horizontal shifts, etc.).

6.4 Fiber Support Equipment

The following equipment shall be installed in the traffic signal control cabinet. Contact Traffic Engineering for the latest approved equipment list.

- Fiber Optic Transceiver
- 8 Port Serial Server (4 Port Serial Server at collector streets)
- 4 Port Video Server
- Copper Media Modem (used with twisted pair copper cable)
- Fiber termination patch panel
- Line Interface Unit (LIU), if required.

7 - CONTROLLER AND CABINET

The following equipment shall be installed in the #9 vault. Contact Traffic Engineering for the latest approved equipment list.

- Fiber optic splice enclosure (using gel cable sealing technology)
- Hanging bracket assembly.

7.1 *Controller*

The Controller Unit shall be a TS2, Type II EPAC 3608 Local System, wired with a "D" connector and Systems Input/Output terminal facility.

7.2 *Cabinet*

The Controller Cabinet shall be a TS2 Type IV per Arizona Department of Transportation Standard Specifications, 1990. It shall be fabricated from aluminum and the finish shall be unpainted and clean.

8 - DETECTORS

8.1 Video Detection

The City of Chandler uses video vehicle detection at all intersections. Video detection cameras are typically mounted on the traffic signal luminaire arm. When a 'J' or 'K' pole is used, refer to Detail TS-21 for mounting requirements. Video detection system will be the Autoscope SoloPro 4 channel system or approved equal.

8.2 Opticom

The City of Chandler uses Opticom pre-emption equipment for emergency vehicles. Opticom detectors are mounted on the signal mast arms, centered between the two outside signal heads. Detectors shall be 3M model 700 series.

9 - SIGNAL HEADS

9.1 Visibility

The visibility of a signal head indication by a driver is the primary consideration in the placement of signal heads. The number of signal heads to be used for each approach shall be based on the policy outlined below.

1. For an approach without a left turn phase, two mastarm heads and one far-Left "A" pole-mounted head shall be used.

2. For an approach with a left turn phase, two mastarm heads are required for The through-right turn movements. One mastarm head and one far-left type "A" pole mounted head shall be used to satisfy the left turn movement.

3. For an approach in which the mastarm heads are located more than 120 Feet from the stop line, one near-right mounted head is required for through-right movements, in addition to the other signal heads Mentioned above.

4. For an approach with an exclusive right-turn lane, one far-right pole mounted head is required.

9.2 Minimum Visibility Distance

The Manual of Uniform Traffic Control Devices (MUTCD) provides minimum visibility distances for signals. The following table, from Section 4B-12 of the MUTCD, provides the minimum distance from which two signals indications shall be continuously seen until reaching the stop bar. In cases where these requirements cannot be met, a "Signal Ahead" sign shall be installed to warn approaching traffic.

9.3 Placement of Signal Heads

Along the mast arm, the signal head for the left turn movement shall be located near the left side of the left turn lane extended. The signal heads for the through-right turn movements shall be located near the left side of the inside and outside through lanes extended. The minimum spacing between signal heads on the mastarm shall be 12 feet.

9.4 Signal Lamps

9.4.1 Vehicle Signals

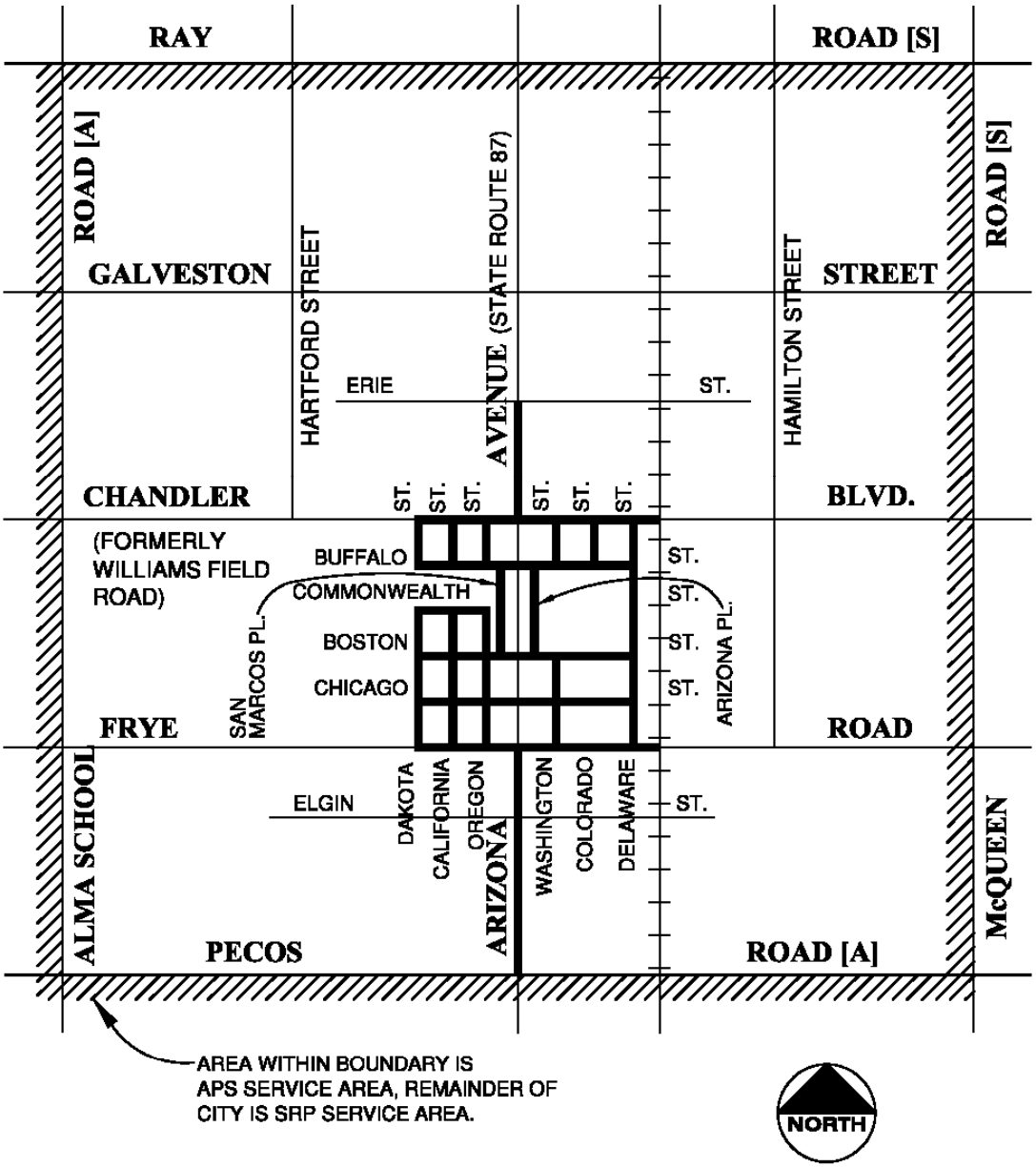
All signal lamps shall be LED and must comply with VTCSH standards published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE).

9.4.2 Pedestrian Signals

Pedestrian traffic signal lamps shall be LED type with pedestrian countdown timers and shall be enclosed in an 18" pedestrian signal housing built to the PTCSI standards published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE). "Hand" and "Man" symbols shall be 12 inches in height and conform to PTCSI standards.

10 - INTERNALLY ILUMINATED STREET NAME SIGNS

New traffic signal installations may require internally illuminated street name signs. Sign installations and placement shall conform to the standards and specifications outlined in the latest edition of the City of Chandler's Standard Details, C-606 through C-610. If height restrictions and/or conflicts exist, the City may consider alternatives to the details. All designs and installations must be approved by the City Transportation Engineer. Refer to Figure TS-18 for a diagram of pole mounting.



City of Chandler
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DELINEATION OF AREAS

DETAIL NO.

TS-1

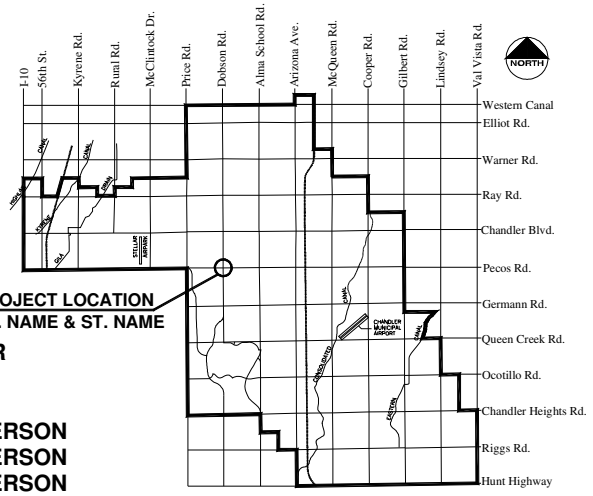
NTS

Chandler + Arizona
Where Values Make The Difference

City of Chandler
Public Works Dept.
215 East Buffalo Street
Chandler, AZ 85225

CITY OF CHANDLER, ARIZONA

PROJECT TITLE HERE



VICINITY MAP

PROJECT LOCATION
ST. NAME & ST. NAME

THIS PROJECT

MAYOR
CURRENT MAYOR

VICE MAYOR
CURRENT VICE MAYOR

COUNCIL
CURRENT COUNCIL PERSON
CURRENT COUNCIL PERSON
CURRENT COUNCIL PERSON
CURRENT COUNCIL PERSON
CURRENT COUNCIL PERSON

APPROVED:

PUBLIC WORKS DIRECTOR _____ DATE _____

CITY ENGINEER _____ DATE _____

CITY TRANSPORTATION ENGINEER _____ DATE _____

PROJECT NO.

PAGE 1 OF ___

Proposed	Existing	
		No. 5 Pull Box
		No. 5 Pull Box w/ Extension
		No. 7 Pull Box
		No. 7 Pull Box w/ Extension
		No. 9 Pull Box
		Signal Luminaire on Pole
		Power Pole
		Control Cabinet
		Load Center Cabinet
		Railroad Cabinet
		Traffic Signal Pole
		Guy Anchor
		Conduit Run
		Luminaire on Mast Arm
		Luminaire on Pole w/ Mast Arm
		Vehicle Movement
		Flashing Amber
		Flashing Red

City of Chandler

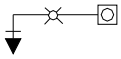
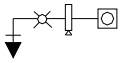
Chandler ✦ Arizona

PLAN SYMBOLS

DETAIL NO.

TS-3

NTS

Proposed	Existing	
		Pole with Mast Arm and Traffic Signal
		Pole with Mast Arms for a Luminaire and Traffic Signal
		Pole with Mast Arms for a Luminaire and Traffic Signal with Video Detection
		Traffic Signal
		Traffic Signal w/ Directional Arrow
		Pedestrian Push Button w/ Sign on Pole
		Traffic Signal Illuminated Message
		Flasher Signal Head
		Pedestrian Push Button w/ Sign on Pole
		Signal Pole Number
		Conduit Run Number
G		Gas Line
OT		Overhead Telephone Line
T		Burried Telephone Line
CATV		Cable Television Line
W		Water Line
SD		Storm Drain
SS		Sanitary Sewer
OE		Overhead Electric
UE		Underground Electric

City of Chandler

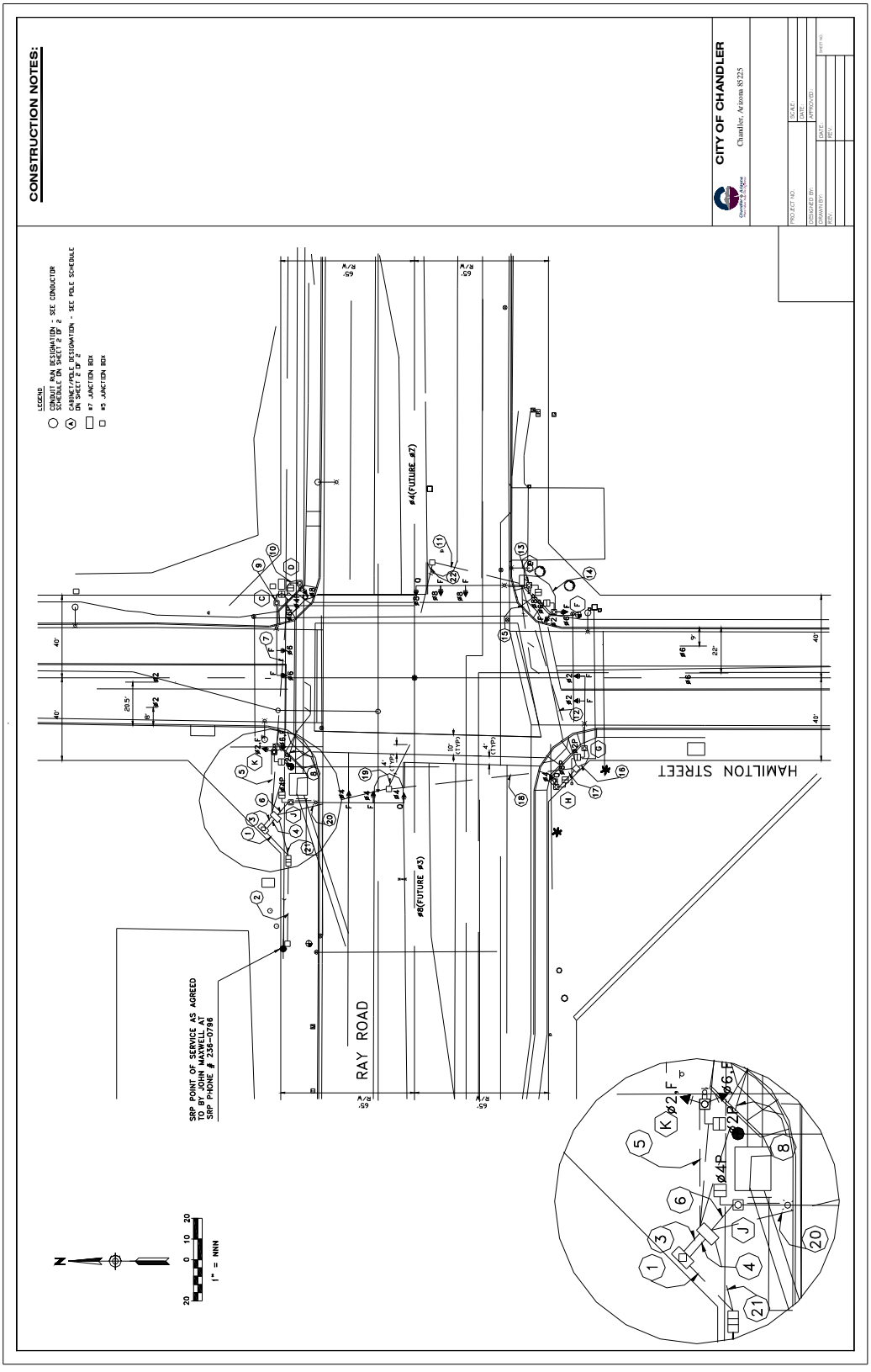
Chandler + Arizona

PLAN SYMBOLS

DETAIL NO.

TS-4

NTS



City of Chandler	PLAN VIEW (SHEET 1)	DETAIL NO. TS-5
Chandler + Arizona		NTS

City of Chandler

Chandler + Arizona

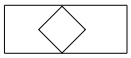
DETAILS AND SCHEDULES (SHEET 2)

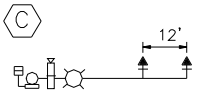
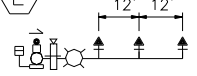
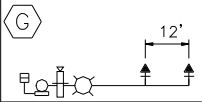
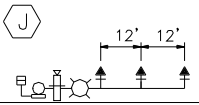
DETAIL NO.

TS-6

NTS

CABINET AND POLE SCHEDULE

CABINETS			ASSEMBLY NOTES	LOCATION
CABINET	TYPE	EQUIPMENT		
(A)  PEC	METER PAD	TESCO OR MYERS	FACE PEC NORTH	STATION AND OFFSET
(B) 	IV	EAGLE – SIGNAL EPAC 300 NEMA TS2 8 PHASE CONTROLLER	INSTALL 4' SQUARE X4" CONCRETE WORK PAD IN FRONT OF FOUNDATION WITH 8" TOE IN FRONT	STATION AND OFFSET

POLES		MAST ARMS		SIGNAL ASSEMBLIES		PED. DET. SIGN	NOTES	LOCATION
ORIENTATION PLAN	TYPE	SIG	LUM	MTG	FACE			
(C) N↓ 	Q	35'	12'	2–II 1–V	2–F 1–M/H		NOTE 1 NOTE 3 NOTE 4 NOTE 5	STATION AND OFFSET
(D) N↓ 	A 10'			1–IV 1–V	1–Q 1–M/H	T.S.11–4 R10–4b(R)	NOTE 2	STATION AND OFFSET
(E) N→ 	R	55'	20'	3–II 1–V	1–Q 2–F 1–M/H	T.S.11–4 R10–4b(L)	NOTE 1 NOTE 3 NOTE 4 NOTE 5	STATION AND OFFSET
(F) N→ 	A 10'			1–VI 1–V	2–F 1–M/H			STATION AND OFFSET
(G) N↑ 	Q	35'	12'	2–II 1–V	2–F 1–M/H		NOTE 1 NOTE 3 NOTE 4 NOTE 5	STATION AND OFFSET
(H) N↑ 	A 10'			1–IV 1–V	1–Q 1–M/H	T.S.11–4 R10–4b(R)	NOTE 2	STATION AND OFFSET
(J) N← 	R	55'	20'	3–II 1–V	1–Q 2–F 1–M/H		NOTE 1 NOTE 3 NOTE 4 NOTE 5	STATION AND OFFSET
(K) N← 	A 10'			1–VI 1–V	2–F 1–M/H	T.S.11–4 R10–4b(L)	NOTE 2	STATION AND OFFSET

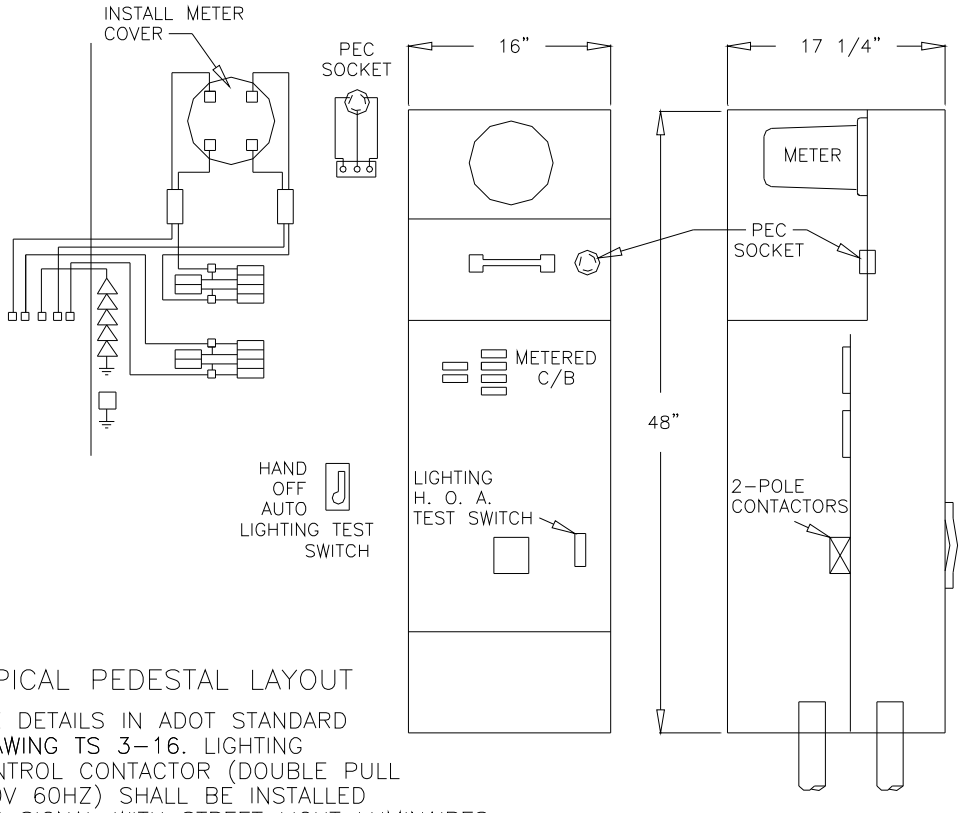
NOTES:

1. INSTALL 3M "OPTICOM" 700 SERIES DETECTOR ON MAST ARM.
2. TYPE I PEDESTRIAN PUSH BUTTON - T.S. 11 - 1.
3. 250 WATT LUMINAIRE, TYPE III, MEDIUM CUTOFF, 120 VOLT.
4. INSTALL ILLUMINATED STREET SIGN.
5. INSTALL AUTOSCOPE SOLO PRO MVP VIDEO DETECTION SYSTEM.
6. INSTALL 8- PORT SERIAL SERVER (4-PORT SERIAL SERVER AT COLECTOR STREETS) W/DB9M CONNECTORS; 8- PORT SINGLE MODE FIBER TRANSCEIVER W/ST CONNECTORS; 4- CHANNEL VIDEO SERVER; AND COPPER MEDIA MODEM (USED WITH TWISTED PAIR COPPER CABLE).

City of Chandler Chandler ✦ Arizona	**CABINET AND POLE SCHEDULE**	DETAIL NO. **TS-7** NTS

CITY OF CHANDLER STANDARD NEMA PHASING

PHASE 1 – NORTHBOUND LEFT TURN
PHASE 2 – SOUTHBOUND THRU
PHASE 3 – EASTBOUND LEFT TURN
PHASE 4 – WESTBOUND THRU
PHASE 5 – SOUTHBOUND LEFT TURN
PHASE 6 – NORTHBOUND THRU
PHASE 7 – WESTBOUND LEFT TURN
PHASE 8 – EASTBOUND THRU



TYPICAL PEDESTAL LAYOUT

SEE DETAILS IN ADOT STANDARD DRAWING TS 3-16. LIGHTING CONTROL CONTACTOR (DOUBLE PULL 120V 60HZ) SHALL BE INSTALLED FOR SIGNAL WITH STREET LIGHT LUMINAIRES.
PROVIDE 50 AMP BREAKER FOR SIGNAL SERVICE.
PROVIDE DOUBLE PULL 20 AMP BREAKER FOR STREET LIGHTS.

TRAFFIC SIGNAL METER PEDESTAL

City of Chandler
Chandler + Arizona

NEMA PHASING AND METER PEDESTAL

DETAIL NO.
TS-8
NTS

CONDUCTOR SCHEDULE

	CONDUIT RUN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CONDUIT SIZE (IN)	2	2	3	3	2	2	3	1 1/2	2	2	2	3	2	2	1 1/2	2	2	3	1 1/2	3	3	1 1/2
AWG																							
#14 20 CONDUCTOR 20-1 I.M.S.A. SIGNAL CABLES NOTE (2)	POLE C			1				1		1													
	POLE D			1				1			1												
	POLE E			1									1	1					1		1		
	POLE F			1									1		1				1		1		
	POLE G			1													1		1		1		
	POLE H			1														1	1		1		
	POLE J			1			1																
	POLE K			1		1																	
IMSA CABLE PART NO. C6106 6 PAIR, 18 AWG	VIDEO DETECTION ø2																						
	VIDEO DETECTION ø4																						
	VIDEO DETECTION ø6																						
	VIDEO DETECTION ø8																						
#6 NOTE (1)	SERVICE 120/240V		3																				
BLACK-HOT WHITE-NEUTRAL GREEN-EQUIPMENT GROUND	SIGNAL CABINET 120V	2																			2		
STREET LIGHTING 120 V	# 10 (RED)			1			1	1		1			1	1			1		1		1		
	COMMON (WHITE)			1			1	1		1			1	1			1		1		1		
STREET NAME SIGN LIGHTING 120 V	# 10 (BROWN)			1			1	1		1			1	1			1		1		1		
	COMMON (WHITE)			1			1	1		1			1	1			1		1		1		
#8 NOTE (1)	CONDUIT BOND (GREEN)	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1		1	1	
FIRE DET. CABLE ---- 3 M MODEL 205 CLIFFORD 3C20T7; SUNSTATES S-2624	FIRE PREEMPT 1						1																
	FIRE PREEMPT 2							1		1													
	FIRE PREEMPT 3												1	1					1		1		
	FIRE PREEMPT 4																1		1		1		
SEE NOTE 3	INTER CONNECT																						

● – INSTALLED BY SRP

▲ – LOOP DUCT #14 THWN WIRE IN PVC TUBING

* – EXISTING

CONDUCTOR NOTES:

(1) MINIMUM NUMBER OF CONDUCTORS REQUIRED (NON-I.M.S.A. TYPE)

(2) MINIMUM NUMBER OF CABLES REQUIRED (INCLUDING I.M.S.A. TYPES)

(3) 25- PAIR, #22 SOLID, FILLED, SHIELDED CABLE, SPEC. 59-2-1997 OR 48- STRAND, SINGLE MODE FIBER OPTIC

City of Chandler

Chandler + Arizona

CONDUCTOR SCHEDULE

DETAIL NO.

TS-9

NTS

I.M.S.A. 20-1 CABLE PHASING SCHEDULE

POLE C-WHITE	POLE E-ORANGE	POLE G-BROWN	POLE J-BLUE
Ø6 R-Y-G	Ø8 R-Y-G	Ø2 R-Y-G	Ø4 YA-GA
Ø6 W-DW	Ø8 YA-GA	Ø2 W-DW	Ø4 R-Y-G
	Ø8 W-DW		Ø4 W-DW
	Ø6 PED P.B.		
	PED P.B. COMMON		
SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
POLE D-RED	POLE F-YELLOW	POLE H-GREEN	POLE K-BLACK
Ø8 RA-GA-YA	Ø2 R-Y-G	Ø4 RA-GA-YA	Ø6 R-Y-G
Ø4 W-DW	Ø6 R-Y-G	Ø8 W-DW	Ø2 R-Y-G
	Ø6 W-DW		Ø2 W-DW
Ø6 PED P.B.		Ø2 PED P.B.	Ø2 PED P.B.
PED P.B. COMMON		PED P.B. COMMON	PED P.B. COMMON
SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON

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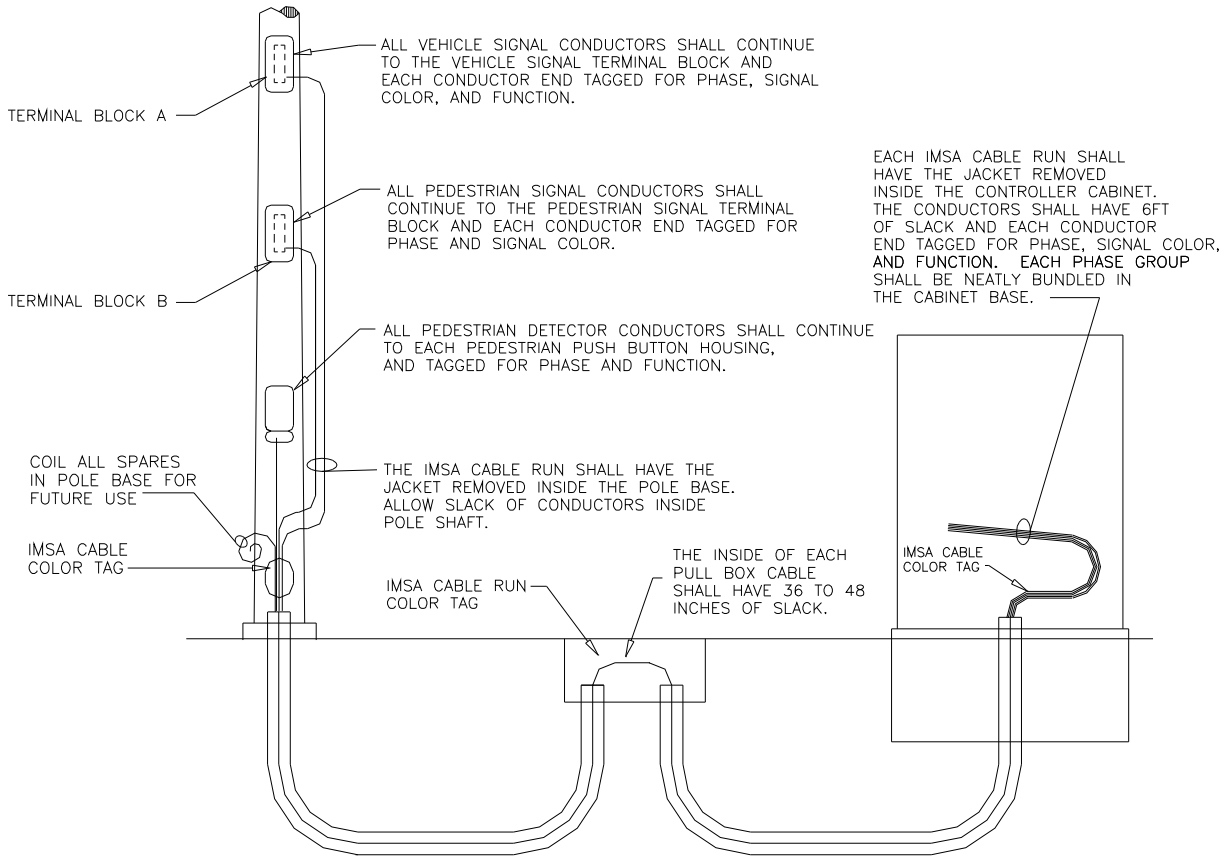
CABLE PHASING AND COLOR CODE SCHEDULE

DETAIL NO.

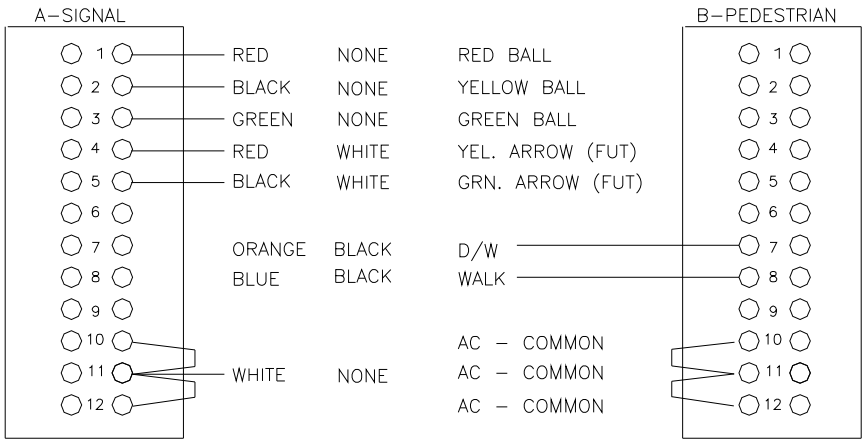
TS-10

NTS

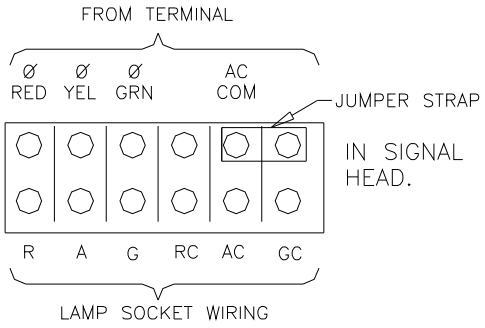


EACH IMSA 20-1 CABLE RUN SHALL BE CONTINUOUS FROM THE SPECIFIC TRAFFIC SIGNAL POLE TO THE TRAFFIC SIGNAL CONTROLLER CABINET, WITHOUT THE USE OF ANY SPLICES.

City of Chandler *Chandler + Arizona*	**INSTALLATION OF I.M.S.A. SIGNAL CABLES**	DETAIL NO. **TS-11** NTS



TERMINAL BLOCKS



SIGNAL INDICATION TERMINAL BLOCK WIRING DETAIL

SIGNAL INDICATION TERMINAL BLOCK WIRING DETAIL

City of Chandler

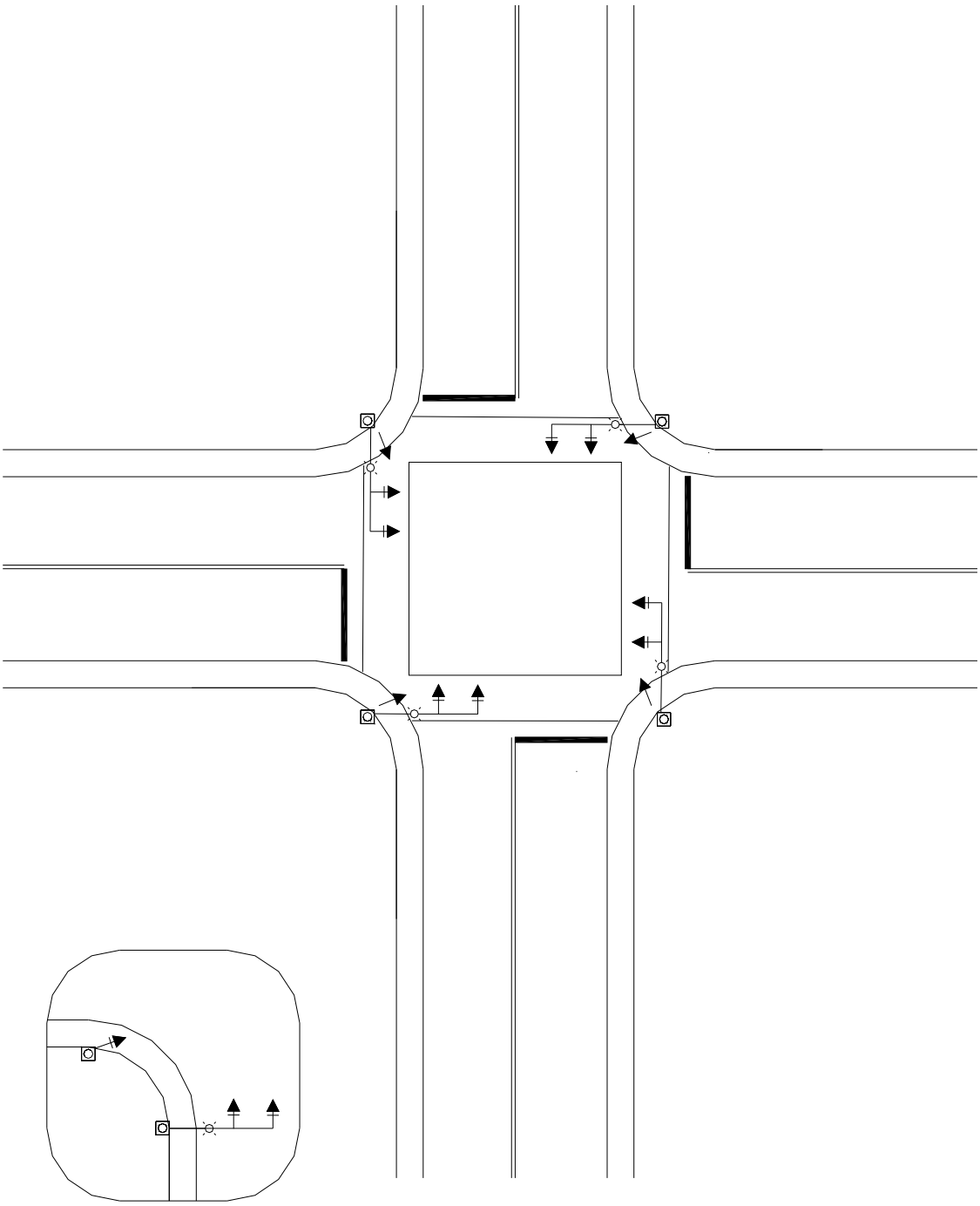
Chandler + Arizona

TERMINAL WIRING DETAILS FOR SIGNALS

DETAIL NO.

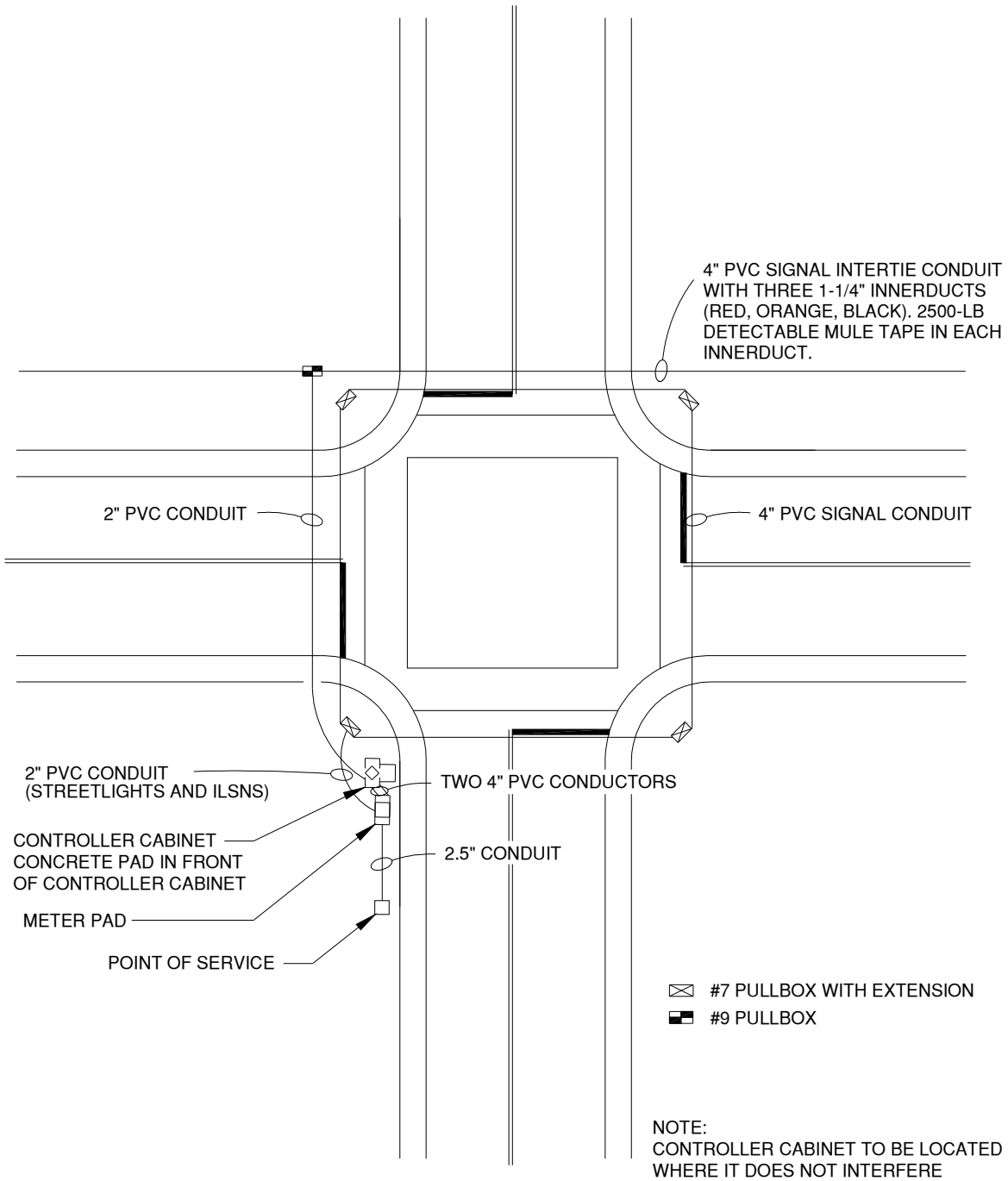
TS-12

NTS



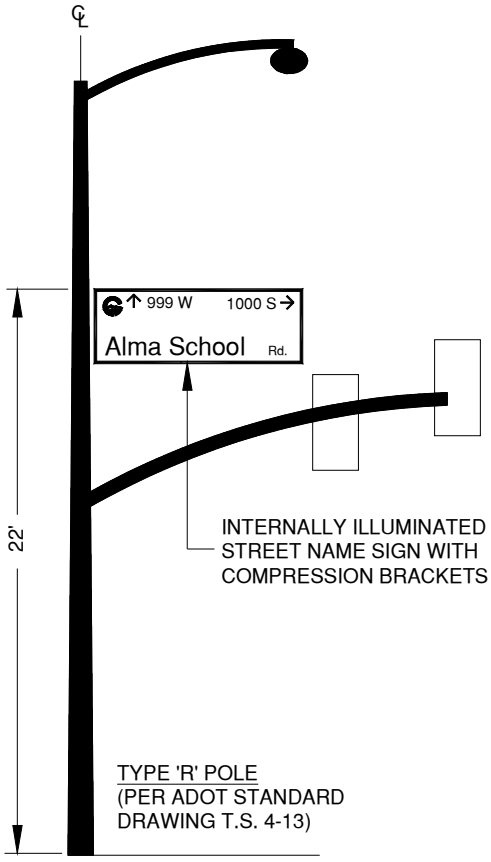
ALTERNATE A-POLE DESIGN

City of Chandler *Chandler + Arizona*	**TYPICAL POLE LAYOUT**	DETAIL NO. **TS-13** NTS

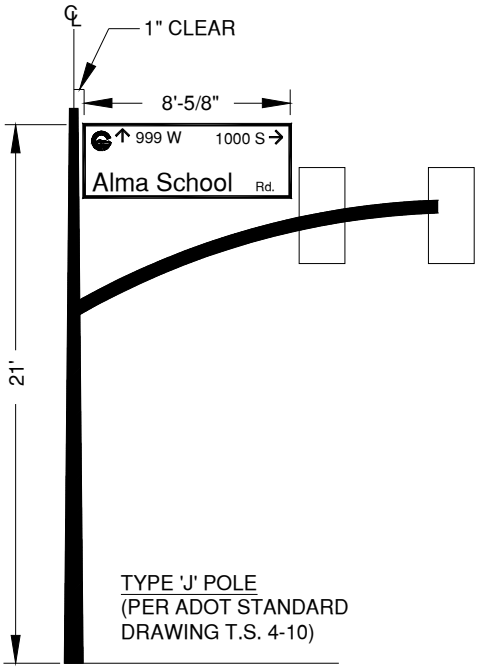


NOTE:
CONTROLLER CABINET TO BE LOCATED WHERE IT DOES NOT INTERFERE WITH ADJACENT LANDSCAPING AND MONUMENT SIGNS.

City of Chandler *Chandler + Arizona*	**JUNCTION BOX AND CONDUIT LOCATIONS**	DETAIL NO. **TS-14** NTS



ELEVATION



ELEVATION

City of Chandler
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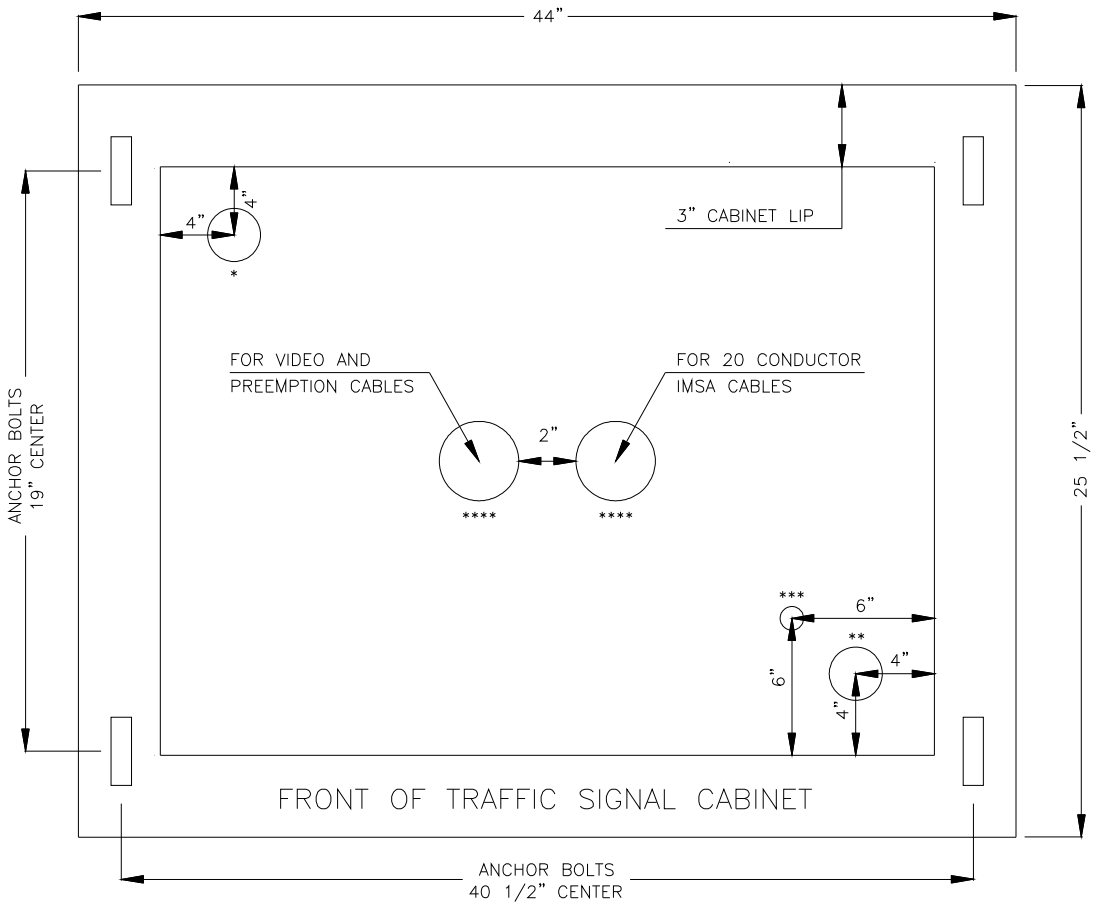
INTERNALLY ILLUMINATED SIGNS

DETAIL NO.
TS-18
NTS



* 2" COMMUNICATIONS CONDUIT
** 2" SERVICE CONDUIT
*** GROUND ROD
**** 4" SIGNAL CONDUIT

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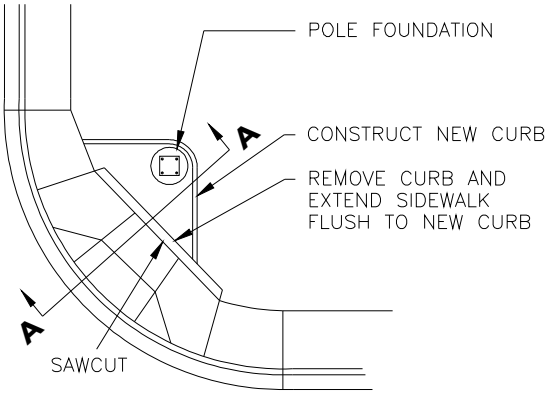
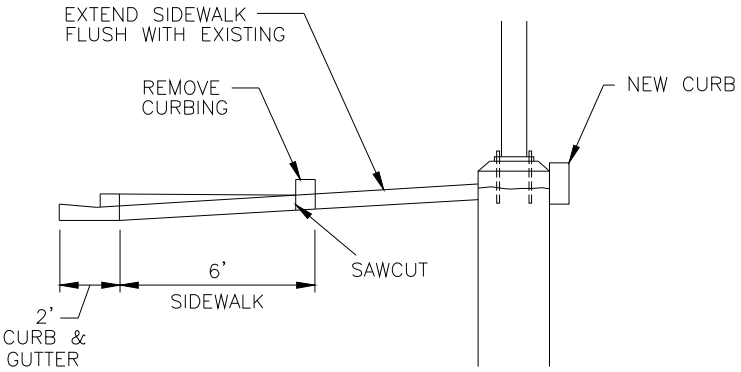
CONTROLLER FOUNDATION CONDUIT LAYOUT DETAIL

DETAIL NO.
TS-19
NTS



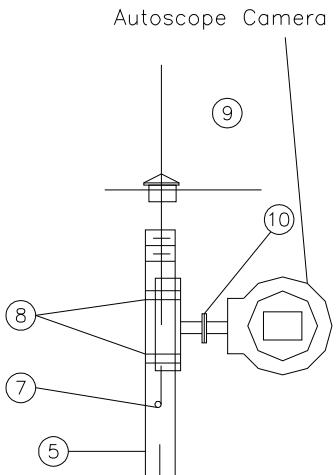


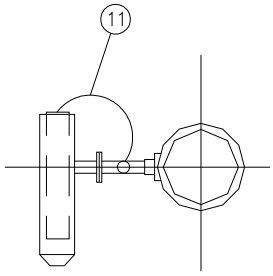
SECTION A-A

City of Chandler  *Chandler + Arizona*	**TRAFFIC SIGNAL SIDEWALK EXTENSION DETAIL**	DETAIL NO. **TS-20** NTS

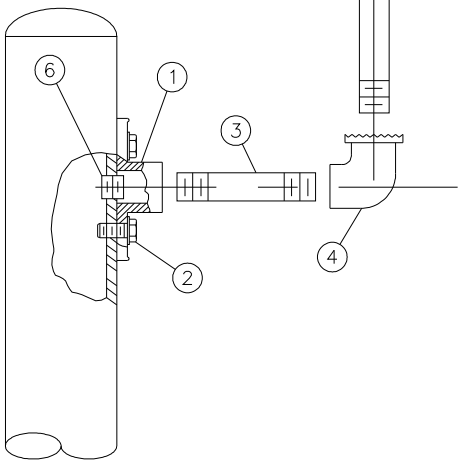
SIDE MOUNT DETAIL

ITEM	QTY.	DESCRIPTION
1	1	POLE PLATE (See Std. Detail S-210-8m)
2	2	BOLTS
3	1	1 1/2" x 8" NIPPLE
4	1	1 1/2" ELBOW (See Std. Dtl. S-210-11m)
5	1	1 1/2" EXTENUATION POLE (5' TO 8' LONG)
6	1	NEOPRENE WASHER
7	1	1/2' DIA. HOLE FOR AUTOSCOPE CABLE
8	2	1/2" STAINLESS STEEL BAND WITH BUCKLE
9	1	ORNAMENTAL CAP INTERNAL THREAD
10	1	AUTOSCOPE BRACKET
11	1	CABLE FOR CAMERA



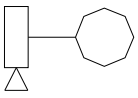


MOUNTING ORIENTATION PLAN
(SEE NOTE 3)



NOTES:

1. CAMERA SHALL BE ALIGNED WITH BACK OF SUNSHIELD
2. FOR POLE DRILLING DETAIL SEE ADOT STD. DRAWING (T.S. 4-18).
3. MOUNTING ORIENTATION MAY DIFFER FROM WHAT IS SHOWN. SEE PLANS FOR DESIRED ORIENTATION.



PLAN SYMBOLS

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AUTOSCOPE MOUNTING FOR "J" OR "K" POLE

DETAIL NO.
TS-21
NTS